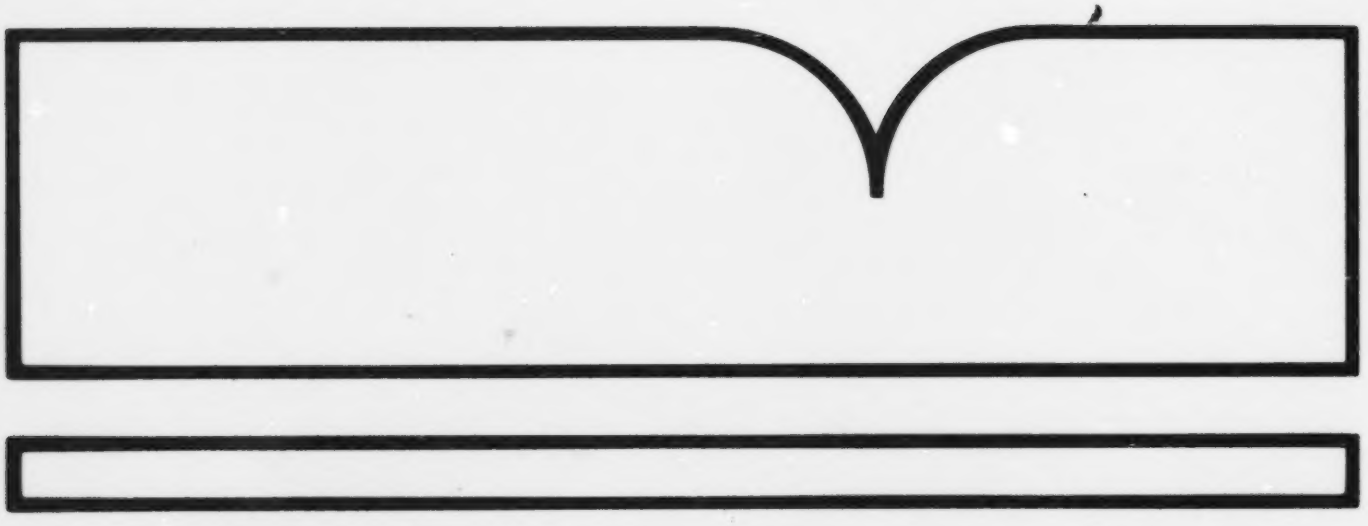
PB90-166158

Proposed Best Demonstrated Available Technology (BDAT) Background Document for K073. Volume 4

(U.S.) Environmental Protection Agency, Washington, DC

Nov 89



U.S. Department of Commerce
National Technical Information Service
NTIS

EPA/530-SW-90-011D

PROPOSED BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT)

BACKGROUND DOCUMENT FOR

K073

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November 1989

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/530-SW-90-011D	2.	3. PB90-166158
4. Title and Subtitle PROPOSED BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT) BACKGROUND DOCUMENT FOR K073			5. Report Date NOVEMBER 1989 6.
7. Author(s) ROSENGRANT/EBY/OSW			8. Performing Organization Rept. No
9. Performing Organization Name and Address U.S. EPA Office of Solid Waste 401 M. Street SW Washington, DC 20460			10. Project/Task/Work Unit No. 11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address			13. Type of Report & Period Covered BACKGROUND DOCU. - 11/89 14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

This background document provides the Agency's technical support for selecting and developing the proposed treatment standards for the constituents to be regulated in K073 waste. This document explains how EPA determines BDAT, selects constituents for regulation and calculates treatment standards.

17. Document Analysis a. Descriptors

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
RELEASE UNLIMITED	UNCLASSIFIED	0
	20. Security Class (This Page) UNCLASSIFIED	22. Price 0

(See ANSI-Z39.18)

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)

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1. INTRODUCTION

Pursuant to section 3004(m) of the Resource Conservation and Recovery Act (RCRA) as enacted by the Hazardous and Solid Waste Amendments on November 8, 1984, the Environmental Protection Agency (EPA) is establishing best demonstrated available technology (BDAT) treatment standards for K073 waste (chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production). Compliance with the BDAT treatment standards is a prerequisite for the placement of the waste in facilities designated as land disposal units according to 40 CFR Part 268. The effective date of the K073 treatment standards is May 8, 1990.

This background document provides the Agency's technical support for selecting and developing the proposed treatment standards for the constituents to be regulated in K073 waste. This document explains how EPA determines BDAT selects constituents for regulation and calculates treatment standards. Section 2 presents waste-specific information--the number and location of facilities affected by the land disposal restrictions, the waste-generating process, and waste characterization data. These data serve as a basis for determining whether a variance from treatment standards may be warranted for a particular type of K073 that is more difficult to treat than the wastes that were analyzed in developing the treatment standards for K073. Section 3 discusses the technologies used to treat the waste (or similar wastes), and Section 4 presents available performance data, including data on which the proposed treatment standards are based. Section 5 explains EPA's determination of BDAT, while Section 6 discusses the selection of constituents to be regulated. The treatment standards are determined in Section 7.

The BDAT program, the Agency's legal authority, and promulgated methodology are described in detail in two additional documents: Methodology for Developing BDAT Treatment Standards (USEPA 1989a) and Generic Quality Assurance Project Plan for Land Disposal Restrictions Program ("BDAT") (USEPA 1987). The petition process to be followed in requesting a variance from the BDAT treatment standards is also discussed in the methodology document.

Under 40 CFR 261.32 wastes identified as K073 are listed as follows: chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production. The Agency believes there are no facilities currently generating this waste.

Five constituents (carbon tetrachloride, chloroform, tetrachloroethene, 1,1,1-trichloroethane, and hexachloroethane) are being proposed for regulation in both nonwastewater and wastewater forms of K073 waste. For the purpose of determining the applicability of the treatment standards, wastewaters are defined as wastes containing less than 1 percent (weight basis) total suspended solids* and less than 1 percent (weight basis) total organic carbon (TOC). Waste not meeting this definition must comply with the treatment standards for nonwastewaters.

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*The term "total suspended solids" (TSS) clarifies EPA's previously used terminology of "total solids" and "filterable solids." Specifically, the quantity of total suspended solids is measured by Method 209c, Total Suspended Solids Dried at 103 -105 C, in Standard Methods for the Examination of Water and Wastewater, 16th Edition (APHA, AWWA, and WPCF 1985).

The Agency does not have performance data for the treatment of K073; therefore, the treatment standards for the regulated volatile and semivolatile organic constituents in both nonwastewaters and wastewaters are transferred from treatment performance of incineration of K019 waste.

Table 1-1, following this section, lists the specific nonwastewater and wastewater treatment standards for K073 waste. The treatment standards reflect the total constituent concentration; the units are mg/kg (parts per million on a weight-by-weight basis) for the nonwastewaters and mg/l (parts per million on a weight-by-volume basis) for the wastewaters. Note that if the concentrations of the regulated constituents in the waste, as generated, are lower than or equal to the treatment standards, then treatment will not be required prior to land disposal.

Table 1-1 Treatment Standards for K073 Waste

Constituent	Maximum for any single grab sample	
	Nonwastewaters	Wastewaters
	Total concentration (mg/kg)	Total concentration (mg/l)
Volatile organics		
Carbon tetrachloride	6.2	0.008
Chloroform	6.2	0.008
Tetrachloroethene	6.2	0.008
1,1,1,-Trichloroethane	6.2	0.008
Semivolatile organics		
Hexachloroethane	28	0.033

NA = Not applicable.

2. INDUSTRY AFFECTED AND WASTE CHARACTERIZATION

According to 40 CFR 261.32, the K073 waste is listed as follows:

K073: Chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production.

This section describes K073 waste, its generation, and the industry affected by the land disposal restriction of the waste.

2.1 Industry Affected and Process Description

K073 waste was formerly generated by the alkali and chlorine industry (Standard Industrial Classification (SIC) code 2812). The Agency, after consulting the TSDR Survey, knows of no facilities that currently generate K073 waste; K073 was last generated in 1988. However, K073 may at some time be generated by RCRA corrective actions, site closures, or other historical sources.

The Agency has no current information on the process by which the waste is generated. The information presented below was contained in the Listing Background Document for K073.

In the diaphragm cell process for chlorine production, chlorine is produced by electrolysis of brine. Brine is purified by precipitation of metals before being sent to the diaphragm cell. Separation of solids during purification generates waste brine muds. The purified brine is heated, brought to saturation by the addition of salt, and acidified. The saturated salt solution is then electrolyzed in the diaphragm cell to form chlorine, hydrogen, and sodium hydroxide. Chlorine is liberated at the anode; the hydrogen and sodium hydroxide are produced at the cathode. Reaction of chlorine with carbonaceous materials in the graphite anode results in the presence of chlorinated hydrocarbon contaminants in the chlorine product.

The hydrogen is either purified and sold, vented to the atmosphere, or burned. The salt solution, which has been decomposed to approximately half its original concentration, is partially evaporated to increase the sodium hydroxide concentration. During evaporation, most of the sodium chloride precipitates from the solution and is recovered in salt separators. After filtration and washing, the salt is recycled to initial brine preparation.

Chlorine is recovered from the cell and cooled to remove water and other impurities. The condensates are discharged or recycled to the brine purifier. After cooling, the chlorine gas is scrubbed with acid to remove residual water vapor. The gas is then compressed and cooled to -30°C to -45°C. At these temperatures, the chlorine liquefies and is pumped to steel storage tanks. Some further purification of chlorine is performed during the cooling and liquefaction process. During the compression and purification step, the K073 is ultimately generated. Figure 2-1 illustrates the process.

2.2 Waste Characterization

EPA was not able to collect characterization data for K073 because generation of this waste has been discontinued. Limited compositional data was provided by The Chlorine Institute, Inc., and the Listing Background Document for K073. Table 2-1 provides an approximation of the composition of K073 waste.

Table 2-1 Composition Data for K073

Constituent	Chlorine Institute wt (%)	Listing Background Document wt (%)
Chloroform	50-80	73.7
Carbon tetrachloride	4-24	10.8
Hexachloroethane		8.0
Pentachloroethane	0-2	1.3
1,1,1-Trichloroethane		1.0
Tetrachloroethylene	0-1	0.6
Dichloroethylene		0.3
1,1,2,2-Tetrachloroethane		0.5
Chlorinated Propane Derivatives		3.7
Trichloroethylene	0-6	
Dissolved Chlorine	0-7	
Others (Unknown)	1-13	

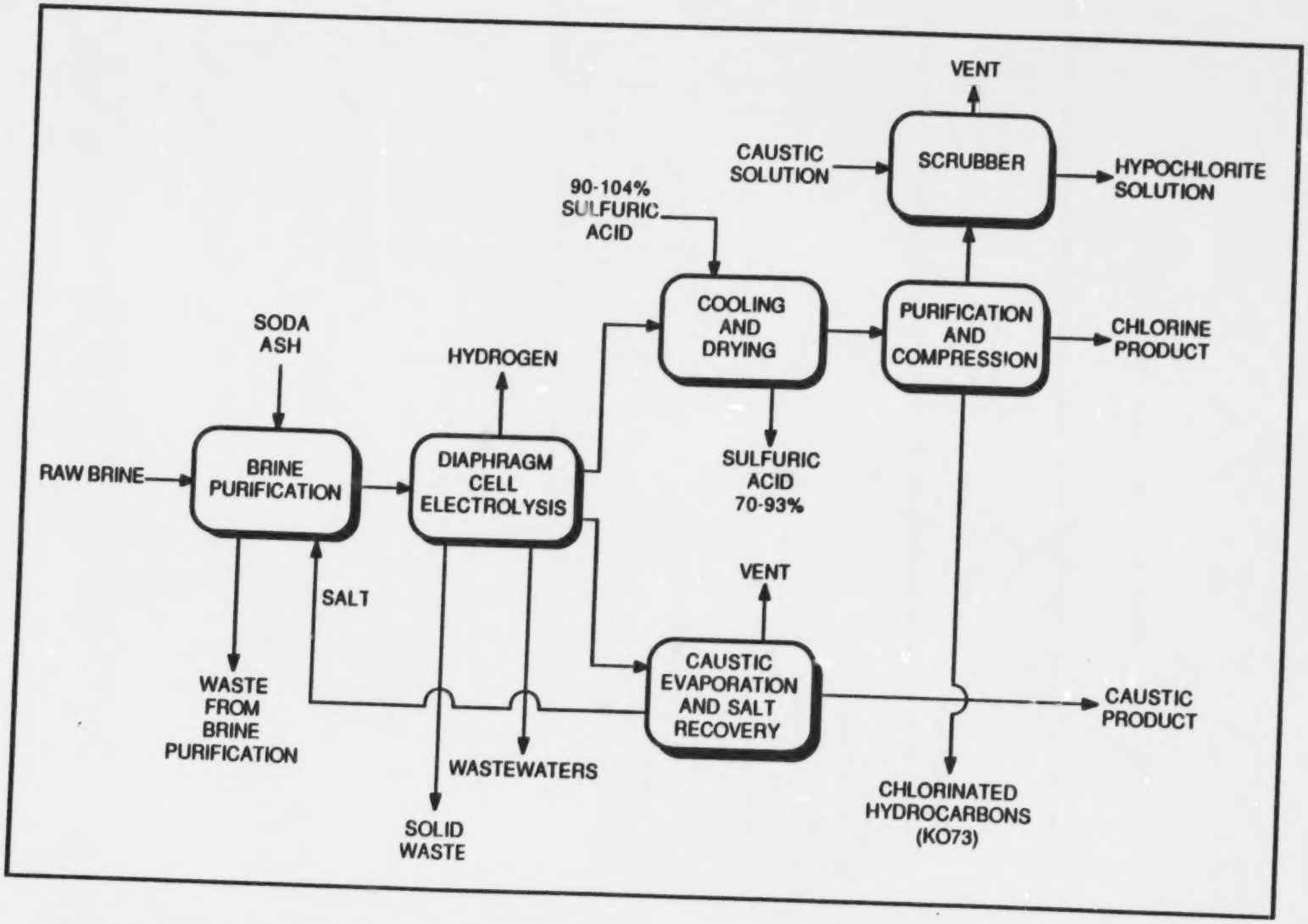

FIGURE 2-1. CHLOR-ALKALI MANUFACTURE DIAPHRAGM CELL PROCESS/GRAPHITE ANODES

3. APPLICABLE AND DEMONSTRATED TREATMENT TECHNOLOGIES

This section identifies the treatment technologies that are applicable to K073 waste and determines which, if any, of the applicable technologies can be considered demonstrated for the purposes of establishing BDAT.

To be applicable, a technology must be theoretically usable to treat the waste in question or to treat a waste that is similar in terms of the parameters that affect treatment selection. (For detailed descriptions of the technologies applicable for these wastes, or for wastes judged to be similar, see EPA's Treatment Technology Background Document (USEPA 1989b).) To be demonstrated, the technology must be employed in full-scale operation for the treatment of the waste in question or a similar waste. Technologies available only at research facilities or in pilot- and bench-scale operations are not considered in identifying demonstrated technologies.

3.1 Applicable Treatment Technologies

As shown in Section 2.2, K073 waste contains primarily organic constituents. Applicable technologies for organic constituents in a waste or any resulting treatment residuals include technologies that destroy or reduce the amount of constituent present in the waste.

The Agency has identified fuel substitution and incineration as applicable technologies for treating the organic constituents in untreated K073 waste. These treatment technologies were identified based on current literature sources, field testing, and current waste treatment practices. As treatment processes, fuel substitution and incineration have the same purpose: to thermally destroy the organic constituents in the waste by converting them to carbon dioxide and water. Fuel substitution additionally uses the waste as a substitute for conventional

fuels burned in high-temperature industrial processes. Both fuel substitution and incineration generally result in nonwastewater and wastewater treatment residuals such as ash, clarifier solids from the flue gas scrubber system, and scrubber water, which may require further treatment. The residuals from the treatment of K073 waste in a well-designed, well-operated fuel substitution combustion device or incinerator are not expected to contain detectable levels of organic constituents (that is, amounts of organic constituents should be below a numerical limit) and thus should not require further treatment for organics.

EPA does not believe that K073 wastewaters, other than scrubber waters from incineration of K073, are likely to be generated. Therefore, no technologies are being discussed for removal of chlorinated organics from K073 wastewaters, since scrubber waters from K073 incineration should be devoid of organics.

3.2 Demonstrated Technologies

There are currently no known generators of K073 waste; therefore, the Agency has no data indicating that incineration or fuel substitution is being used on K073 waste. The Agency does have data, however, on incineration of a similar waste (K019) and believes, therefore, that incineration would be a demonstrated technology for K073 waste. The Agency has no evidence that fuel substitution is being used on wastes having similar chlorinated organic concentrations. When chlorinated hydrocarbons are combusted, hydrogen chloride gas or chlorine gas is produced. These gases may not be compatible with normal fuel uses in industrial furnaces or boilers (i.e., they may not be compatible with the furnace materials of construction or the furnace product quality). Thus EPA does not believe that fuel substitution would be a demonstrated technology for K073 waste. Incineration, therefore, is the only demonstrated technology for K073 waste.

4. PERFORMANCE DATA BASE

Where data are not available on the treatment of the specific wastes of concern, the Agency may elect to transfer data on the treatment of a similar waste or wastes, using a demonstrated technology. To transfer data from another waste category, EPA must find that the wastes covered by this background document are no more difficult to treat (based on the waste characteristics that affect performance of the demonstrated treatment technology) than the treated wastes from which performance data are being transferred.

This section presents the data available to EPA on the performance of demonstrated technologies in treating the listed wastes. These data are used elsewhere in this document for determining which technologies represent BDAT (Section 5), for selecting constituents to be regulated (Section 6), and for developing treatment standards (Section 7). Eligible data, in addition to full-scale demonstration data, may include data developed at research facilities or obtained through other applications at less than full-scale operation, as long as the technology is demonstrated in full-scale operation for a similar waste or wastes as defined in Section 3.

Performance data, to the extent that they are available to EPA, include the untreated and treated waste concentrations for a given constituent, values of operating parameters that were measured at the time the waste was being treated, values of relevant design parameters for the treatment technology, and data on waste characteristics that affect performance of the treatment technology.

No performance data are available to the Agency to characterize treatment for K073. (K073 can be characterized as a totally organic waste and no metals treatment standards are justified.) However, the Agency has data for incineration of a similar waste, K019, which, as defined by 40 CFR 261.32, is the heavy ends from the distillation of ethylene dichloride in ethylene dichloride production. K019 contains all the constituents expected to be present in K073 (i.e., carbon tetrachloride, chloroform, hexachloroethane, tetrachloroethene, and 1,1,1-trichloroethane). This similarity between K019 and K073 is based on the production processes, the waste compositions, and the waste characteristics affecting performance of the demonstrated treatment technology. Evaluation of the waste composition for K073 reveals that this waste is composed primarily of chloroform and carbon tetrachloride, for which the respective boiling points are 61°C and 76.8°C. These boiling points are lower than the boiling points of most constituents in K019. A waste is considered easier to treat if the boiling points of its constituents are lower than the boiling points of constituents in a waste considered for transfer. This is outlined in detail in the Methodology Document (USEPA 1989a). Therefore, K019 is considered more difficult to treat than K073. The K019 constituents which are present in K073 have been treated to nondetectable levels (levels below the numerical limit of detection). The waste characteristics affecting the performance of incineration are presented in the Treatment Technology Background Document (USEPA 1989b). The Agency is transferring performance data from the treatment of K019 to the K073 wastes since the Agency believes that K073 is no more difficult to treat than the tested K019 waste.

The performance data for K019 waste include the untreated and treated waste concentrations for a given constituent, the values of operating parameters that were measured at the time the waste was being treated,

the values of relevant design parameters for the treatment technology, and data on waste characteristics that affect the performance of the treatment technology.

Tables 4-1 through 4-12 present the data of total waste concentration analyses for treated and untreated K019 waste, as well as the design and operating data for the incineration treatment system. Based on a review of the operating data obtained during collection of the samples, the data sets appear to reflect treatment by a well-operated system. Furthermore, in all cases the BDAT list organics detected in the untreated waste are reduced to nondetectable levels in the treated residuals.

Tables 4-7 through 4-12 present K019 scrubber water composition and show that all organic constituents are below detection limits. Consequently, no treatment technology needs to be selected as BDAT for scrubber waters.

Table 4-1 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #1

Detected BDAT List Organic Constituents	Untreated Waste: K019 Concentration mg/kg (ppm)	Untreated Waste: RCRA Blend* Concentration mg/kg (ppm)	Treated Waste: Kiln Ash Concentration mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	4,000	<8	<2
9. Chlorobenzene	3,000	<8	<2
14. Chloroform	4,600	<8	<2
22. 1,1-Dichloroethane	2,200	<8	<2
23. 1,2-Dichloroethane	93,000	<8	<2
34. Methyl ethyl ketone	<1,000	940	<10
38. Methylene chloride	<1,000	910	<10
42. Tetrachloroethene	7,300	490	<2
43. Toluene	<200	2,300	<2
45. 1,1,1-Trichloroethane	81,000	130	<2
47. Trichloroethene	3,210	360	<2
215-217. Xylene (total)	<200	3,400	<2
222. Acetone	<1,000	1,200	<10
226. Ethyl benzene	<200	2,200	<2
229. Methyl isobutyl ketone	<1,000	1,100	<10
SEMIVOLATILES			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	280	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	81	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	20	53	<2
110. Hexachlorobenzene	69	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-1 (Continued)

SAMPLE SET #1 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste: K019 Concentration mg/kg (ppm)	Untreated Waste: RCRA Blend* Concentration mg/kg (ppm)	Treated Waste: Kiln Ash Concentration mg/kg (ppm)	Treated Waste: Kiln Ash TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	120	<100	<10	
121. Naphthalene	470	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	61	<100	<10	
141. Phenanthrene	21	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	76	<50	<5	
150. 1,2,4-Trichlorobenzene	100	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	8.0	<0.060
155. Arsenic	1.2	94	3.6	<0.002
156. Barium	0.97	1.3	26	0.033
158. Cadmium	0.63	<0.3	0.66	<0.003
159. Chromium	4.0	40	44	0.200
160. Copper	2.1	165	2,370	2.690
161. Lead	3.4	27	120	0.380
163. Nickel	3.0	8.8	66	0.680
165. Silver	<0.9	<0.9	3.3	<0.009
167. Vanadium	<2.0	2.2	4.1	<0.020
168. Zinc	5.8	4,170	12	0.052
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	38	
171. Sulfide	790	830	68	

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-1 (Continued)

SAMPLE SET #1 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (°F)+	*	1825-1900
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 13.1 RCRA Blend, Waste Burner #1: 3.9-5.5 RCRA Blend, Waste Burner #2: 4.4-9.7
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-2 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #2

Detected BDAT List Organic Constituents	Untreated Waste: K019 Concentration mg/kg (ppm)	Untreated Waste: RCRA Blend* Concentration mg/kg (ppm)	Treated Waste: Kiln Ash Concentration mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	3,800	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	5,800	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	96,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	6,700	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	33,000	130	<2
47. Trichloroethene	2,400	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
SEMIVOLATILES			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	280	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	74	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	16	53	<2
110. Hexachlorobenzene	60	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-2 (Continued)

SAMPLE SET #2 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)	Treated Waste Kiln Ash TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	85	<100	<10	
121. Naphthalene	314	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	51	<100	<10	
141. Phenanthrene	15	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	62	<50	<5	
150. 1,2,4-Trichlorobenzene	65	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	6.8	<0.060
155. Arsenic	<0.2	94	2.8	<0.002
156. Barium	<0.9	1.3	23	0.036
158. Cadmium	0.46	<0.3	0.96	0.004
159. Chromium	3.4	40	60	0.130
160. Copper	1.7	165	3,430	2.380
161. Lead	2.3	27	42	0.260
163. Nickel	3.6	8.8	89	0.560
165. Silver	<0.9	<0.9	3.4	<0.009
167. Vanadium	<2.0	2.2	4.8	<0.020
168. Zinc	6.9	4,170	13	0.071
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	5.1	
171. Sulfide	NA	830	<50	

NA Not Analyzed.

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-2 (Continued)

SAMPLE SET #2 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (°F)+	*	1800-1880
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 12.2 RCRA Blend, Waste Burner #1: 5.2-5.5 RCRA Blend, Waste Burner #2: 4.4-9.7
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-3 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #3

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	3,500	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	5,000	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	87,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	6,000	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	34,000	130	<2
47. Trichloroethene	2,200	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
SEMIVOLATILES			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	290	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	80	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	19	53	<2
110. Hexachlorobenzene	73	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-3 (Continued)

SAMPLE SET #3 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)	Treated Waste Kiln Ash TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	95	<100	<10	
121. Naphthalene	350	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	59	<100	<10	
141. Phenanthrene	11	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	67	<50	5	
150. 1,2,4-Trichlorobenzene	70	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	9.2	<0.060
155. Arsenic	<0.2	94	5.7	<0.002
156. Barium	<0.9	1.3	54	0.057
158. Cadmium	0.53	<0.3	3.6	0.005
159. Chromium	3.5	40	202	0.260
160. Copper	1.7	165	2,290	7.030
161. Lead	3.4	27	118	0.620
163. Nickel	2.3	8.8	169	0.960
165. Silver	<0.9	<0.9	1.9	<0.009
167. Vanadium	<2.0	2.2	6.0	<0.020
168. Zinc	4.4	4,170	16	0.170
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	6.1	
171. Sulfide	NA	830	64	

NA = Not Analyzed.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-3 (Continued)

SAMPLE SET #3 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (°F)+	*	1850-1900
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 12.4 RCRA Blend, Waste Burner #1: 5.2-5.8 RCRA Blend, Waste Burner #2: 4.4-8.4
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-4 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #4

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	3,900	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	5,300	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	122,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	7,200	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	44,000	130	<2
47. Trichloroethene	2,300	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
SEMIVOLATILES			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	310	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	12
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	84	32	<2
98. Di-n-butyl phthalate	<10	31	230
108. Fluoranthene	<10	120	<2
109. Fluorene	21	53	<2
110. Hexachlorobenzene	61	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

SAMPLE SET #4 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)	Treated Waste Kiln Ash TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	94	<100	<10	
121. Naphthalene	360	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	64	<100	<10	
141. Phenanthrene	19	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	82	<50	<5	
150. 1,2,4-Trichlorobenzene	74	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	<6.0	<0.060
155. Arsenic	<0.2	94	5.7	<0.002
156. Barium	<0.9	1.3	8.4	0.036
158. Cadmium	<0.3	<0.3	<0.3	0.005
159. Chromium	1.8	40	28	0.110
160. Copper	<1.0	165	1,270	1.940
161. Lead	2.4	27	25	0.320
163. Nickel	2.2	8.8	69	0.870
165. Silver	<0.9	<0.9	2.6	<0.009
167. Vanadium	<2.0	2.2	<2.0	<0.020
168. Zinc	9.4	4,170	11	0.056
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	3.2	
171. Sulfide	NA	830	<50	

NA = Not Analyzed.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-4 (Continued)

SAMPLE SET #4 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (°F)+	*	1775-1900
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 12.7 RCRA Blend, Waste Burner #1: 5.2-5.8 RCRA Blend, Waste Burner #2: 4.4-7.3
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-5 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #5

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	4,000	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	6,000	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	130,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	7,800	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	45,000	130	<2
47. Trichloroethene	2,500	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
SEMIVOLATILES			
51. Acenaphthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	340	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	90	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	19	53	<2
110. Hexachlorobenzene	87	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

SAMPLE SET #5 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)	Treated Waste Kiln Ash TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	113	<100	<10	
121. Naphthalene	371	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	63	<100	<10	
141. Phenanthrene	19	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	73	<50	<5	
150. 1,2,4-Trichlorobenzene	72	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	9.1	<0.060
155. Arsenic	<0.2	94	3.9	<0.002
156. Barium	<0.9	1.3	21	0.054
158. Cadmium	0.36	<0.3	1.2	0.006
159. Chromium	3.2	40	125	0.210
160. Copper	2.1	165	2,780	2.140
161. Lead	2.5	27	86	0.290
163. Nickel	4.8	8.8	166	1.270
165. Silver	<0.9	<0.9	3.3	<0.009
167. Vanadium	<2.0	2.2	5.7	<0.020
168. Zinc	4.7	4,170	22	0.086
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	23	
171. Sulfide	NA	830	64	

NA = Not Analyzed.

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-5 (Continued)

SAMPLE SET #5 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (°F)+	*	1775-1800
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 11.7 RCRA Blend, Waste Burner #1: 5.5-6.0 RCRA Blend, Waste Burner #2: 5.2-9.7
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-6 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - ROTARY KILN INCINERATOR

SAMPLE SET #6

Detected BDAT List Organic Constituents	Untreated Waste: K019 Concentration mg/kg (ppm)	Untreated Waste: RCRA Blend* Concentration mg/kg (ppm)	Treated Waste: Kiln Ash Concentration mg/kg (ppm)
VOLATILES			
4. Benzene	<2,000	2,000	<2
7. Carbon tetrachloride	4,100	<8	<2
9. Chlorobenzene	<2,000	<8	<2
14. Chloroform	5,600	<8	<2
22. 1,1-Dichloroethane	<2,000	<8	<2
23. 1,2-Dichloroethane	98,000	<8	<2
34. Methyl ethyl ketone	<10,000	940	<10
38. Methylene chloride	<10,000	910	<10
42. Tetrachloroethene	6,900	490	<2
43. Toluene	<2,000	2,300	<2
45. 1,1,1-Trichloroethane	44,000	130	<2
47. Trichloroethene	2,500	360	<2
215-217. Xylene (total)	<2,000	3,400	<2
222. Acetone	<10,000	1,200	<10
226. Ethyl benzene	<2,000	2,200	<2
229. Methyl isobutyl ketone	<10,000	1,100	<10
SEMIVOLATILES			
51. Acenapthalene	<10	150	<2
57. Anthracene	<10	110	<2
65. Benzo(k)fluoranthene	<10	67	<2
68. Bis(2-chloroethyl) ether	330	<20	<2
70. Bis(2-ethylhexyl) phthalate	<10	40	<2
80. Chrysene	SNA	28	<2
87. o-Dichlorobenzene	<10	250	<2
88. p-Dichlorobenzene	90	32	<2
98. Di-n-butyl phthalate	<10	31	<2
108. Fluoranthene	<10	120	<2
109. Fluorene	22	53	<2
110. Hexachlorobenzene	66	<100	<10

SNA A standard is not available; the compound was searched using an NBS Library database of 42,000 compounds. The compound was not detected.

* Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-6 (Continued)

SAMPLE SET #6 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste K019 Concentration mg/kg (ppm)	Untreated Waste RCRA Blend* Concentration mg/kg (ppm)	Treated Waste Kiln Ash Concentration mg/kg (ppm)	Treated Waste Kiln Ash TCLP mg/L (ppm)
SEMIVOLATILES (Continued)				
111. Hexachlorobutadiene	<50	210	<10	
113. Hexachloroethane	88	<100	<10	
121. Naphthalene	390	<20	<2	
126. Nitrobenzene	<25	3,400	<5	
136. Pentachlorobenzene	65	<100	<10	
141. Phenanthrene	17	240	<2	
142. Phenol	<10	78	<2	
145. Pyrene	<10	200	<2	
148. 1,2,4,5-Tetrachlorobenzene	86	<50	<5	
150. 1,2,4-Trichloroenzene	79	<50	<5	
Detected BDAT List Metal and Inorganic Constituents				
METALS				
154. Antimony	<6.0	24	9.6	< 0.06
155. Arsenic	<0.2	94	2.3	<0.002
156. Barium	<0.9	1.3	11	0.027
158. Cadmium	0.62	<0.3	2.2	0.006
159. Chromium	5.3	40	141	0.092
160. Copper	3.6	165	2,520	2.400
161. Lead	3.5	27	34	0.270
163. Nickel	6.0	8.8	288	0.690
165. Silver	<0.9	<0.9	3.1	<0.009
167. Vanadium	<2.0	2.2	8.7	<0.020
168. Zinc	8.4	4,170	13	0.061
INORGANICS				
169. Total Cyanide	<0.5	0.9	<0.47	
170. Fluoride	<5.0	31	4.7	
171. Sulfide	NA	830	92	

NA = Not Analyzed.

*Only one sample of RCRA Blend waste was taken. The results are repeated in each sample set.

Table 4-6 (Continued)

SAMPLE SET #6 (Continued)

DESIGN AND OPERATING PARAMETERS

Parameter	Design	Operating Value
Kiln Temperature (°F)+	*	1775-1850
Kiln Solids Residence Time (min)	*	120
Waste Feed Rate (MMBTU/hr)+	*	K019: 11.5 RCRA Blend, Waste Burner #1: 5.2-5.8 RCRA Blend, Waste Burner #2: 5.2-9.7
Kiln Rotational Speed (RPM)	*	0.19-0.21

*This information has been claimed as RCRA Confidential Business Information.

Table 4-7 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #1

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
VOLATILES					
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002
7. Carbon tetrachloride	4,000	<8	<2,000	1.90	<0.002
9. Chlorobenzene	3,000	<8	<2,000	<0.4	<0.002
14. Chloroform	4,600	<8	<2,000	<0.4	<0.002
21. Dichlorodifluoromethane	<200	<8	<2,000	<0.4	<0.002
22. 1,1-Dichloroethane	2,200	<8	<2,000	<0.4	<0.002
23. 1,2-Dichloroethane	93,000	<8	<2,000	<0.4	<0.002
34. Methyl ethyl ketone	<1,000	940	<10,000	3.5	<0.01
38. Methylene chloride	<1,000	910	<10,000	<2.0	<0.01
42. Tetrachloroethene	7,300	490	<2,000	<0.4	<0.002
43. Toluene	<200	2,300	41,000	3.7	<0.002
45. 1,1,1-Trichloroethane	81,000	130	<2,000	2.3	<0.002
47. Trichloroethene	3,210	360	3,600	<0.4	<0.002
215-217. Xylene (total)	<200	3,400	36,000	4.4	<0.002
222. Acetone	<1,000	1,200	<10,000	<2.0	<0.01
226. Ethyl benzene	<200	2,200	16,000	4.1	<0.002
229. Methyl isobutyl ketone	<1,000	1,100	<10,000	<2.0	<0.01
SEMIVOLATILES					
51. Acenaphthalene	<10	150	120	<0.002	<0.002
52. Acenaphthene	<10	<20	480	<0.002	<0.002
56. Aniline	<25	<50	<250	1.22	<0.005
57. Anthracene	<10	110	400	<0.002	<0.002
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002
68. Bis(2-chloroethyl)ether	280	<20	<100	<0.002	<0.002
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-7 (Continued)

SAMPLE SET #1 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
SEMIVOLATILES (Continued)					
80. Chrysene	SNA	28	<100	<0.002	<0.002
81. ortho-Cresol	<10	<20	<100	0.020	<0.002
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002
88. p-Dichlorobenzene	81	32	460	0.260	<0.002
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.005
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005
98. Di-n-butyl phthalate	<10	31	120	0.012	<0.002
104. Di-n-octyl phthalate	<10	<20	430	<0.002	<0.002
108. Fluoranthene	<10	120	300	<0.002	<0.002
109. Fluorene	20	53	340	<0.002	<0.002
110. Hexachlorobenzene	69	<100	<500	0.022	<0.010
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.010
113. Hexachloroethane	120	<100	<500	0.018	<0.010
121. Naphthalene	470	<20	400	0.133	<0.002
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.005
136. Pentachlorobenzene	61	<100	1,000	0.020	<0.010
141. Phenanthrene	21	240	950	<0.002	<0.002
142. Phenol	<10	78	1,000	4.56	<0.002
145. Pyrene	<10	200	260	<0.002	<0.002
148. 1,2,4,5-Tetrachlorobenzene	76	<50	1,400	0.008	<0.005
150. 1,2,4-Trichlorobenzene	100	<50	19,000	1.24	<0.005
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.010

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-7 (Continued)

SAMPLE SET #1 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.41
155. Arsenic	1.2	94	7.4	<0.020	0.046
156. Barium	0.97	1.3	<19	1.670	0.48
157. Beryllium	<0.1	<0.1	NA	<0.001	<0.001
158. Cadmium	0.63	<0.3	<33	<0.003	0.23
159. Chromium	4.0	40	23.7	<0.009	0.11
160. Copper	2.1	165	107	0.027	1.81
161. Lead	3.4	27	<7.3	0.0064	0.82
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.002
163. Nickel	3.0	8.8	6.2	0.037	0.081
165. Silver	<0.9	<0.9	<18	0.018	0.085
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.16
168. Zinc	5.8	4,170	6810	0.071	11.4
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	<5.0	31	15	0.950	20.0
171. Sulfide	790	830	16,000	17.0	<1.0
PCBs					
206. Aroclor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-7 (Continued)

SAMPLE SET #1 (Continued)

DESIGN AND OPERATING PARAMETERS	DESIGN	OPERATING VALUE++
Afterburner Temperature (^{o}F)+	*	2380
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)+	*	PCB Blend Feed Rate: 36.1 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)+		6.8
Carbon Monoxide Concentration (ppm volume)		NR

NR Not Recorded.

*This information has been claimed as RCRA Confidential Business Information.

Table 4-8 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #2

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
VOLATILES					
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002
7. Carbon tetrachloride	3,800	<8	<2,000	1.90	<0.002
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002
14. Chloroform	5,800	<8	<2,000	<0.4	<0.002
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	<0.002
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002
23. 1,2-Dichloroethane	96,000	<8	<2,000	<0.4	<0.002
34. Methyl ethyl ketone	<10,000	940	<10,000	3.5	<0.010
38. Methylene chloride	<10,000	910	<10,000	<2.0	<0.010
42. Tetrachloroethene	6,700	490	<2,000	<0.4	<0.002
43. Toluene	<2,000	2,300	41,000	3.7	0.0032
45. 1,1,1-Trichloroethane	33,000	130	<2,000	2.3	<0.002
47. Trichloroethene	2,400	360	3,600	<0.4	<0.002
215-217. Xylene (total)	<2,000	3,400	36,000	4.4	<0.002
222. Acetone	<10,000	1,200	<10,000	<2.0	<0.01
226. Ethyl benzene	<2,000	2,200	16,000	4.1	<0.002
229. Methyl isobutyl ketone	<10,000	1,100	<10,000	<2.0	<0.01
SEMIVOLATILES					
51. Acenaphthalene	<10	150	120	<0.002	<0.002
52. Acenaphthene	<10	<20	480	<0.002	<0.002
56. Aniline	<25	<50	<250	1.22	<0.005
57. Anthracene	<10	110	400	<0.002	<0.002
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002
68. Bis(2-chloroethyl)ether	280	<20	<100	<0.002	<0.002
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-8 (Continued)

SAMPLE SET #2 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
SEMIVOLATILES (Continued)					
80. Chrysene	SNA	28	<100	<0.002	<0.002
81. ortho-Cresol	<10	<20	<100	0.020	<0.002
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002
88. p-Dichlorobenzene	74	32	460	0.260	<0.002
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.005
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005
98. Di-n-butyl phthalate	<10	31	120	0.012	0.0063
104. Di-n-octyl phthalate	<10	<20	430	<0.002	<0.002
108. Fluoranthene	<10	120	300	<0.002	<0.002
109. Fluorene	16	53	340	<0.002	<0.002
110. Hexachlorobenzene	60	<100	<500	0.022	<0.010
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.010
113. Hexachloroethane	85	<100	<500	0.018	<0.010
121. Naphthalene	314	<20	400	0.133	<0.002
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.005
136. Pentachlorobenzene	51	<100	1,000	0.020	<0.010
141. Phenanthrene	15	240	950	<0.002	<0.002
142. Phenol	<10	78	1,000	4.56	<0.002
145. Pyrene	<10	200	260	<0.002	<0.002
148. 1,2,4,5-Tetrachlorobenzene	62	<50	1,400	0.008	<0.005
150. 1,2,4-Trichlorobenzene	65	<50	19,000	1.24	<0.005
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.010

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-8 (Continued)

SAMPLE SET #2 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.39
155. Arsenic	<0.2	94	7.4	<0.020	0.038
156. Barium	<0.9	1.3	<19	1.670	0.50
157. Beryllium	<0.1	<0.1	NA	<0.001	<0.001
158. Cadmium	0.46	<0.3	<33	<0.003	0.19
159. Chromium	3.4	40	23.7	<0.009	0.14
160. Copper	1.7	165	107	0.027	1.38
161. Lead	2.3	27	<7.3	0.0064	0.78
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.0026
163. Nickel	3.6	8.8	6.2	0.037	0.068
165. Silver	<0.9	<0.9	<18	0.018	0.095
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.18
168. Zinc	6.9	4,170	6810	0.071	11.0
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	<5.0	31	15	0.950	15.0
171. Sulfide	NA	830	16,000	17.0	<1.0
PCBs					
206. Aroclor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-8 (Continued)

SAMPLE SET #2 (Continued)

DESIGN AND OPERATING PARAMETERS	DESIGN	OPERATING VALUE↔
Afterburner Temperature (°F)+	*	2400
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)+	*	PCB Blend Feed Rate: 36.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)+		7.0
Carbon Monoxide Concentration (ppm volume)		NR

NR Not Recorded.

*This information has been claimed as RCRA Confidential Business Information.

Table 4-9 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #3

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
VOLATILES					
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002
7. Carbon tetrachloride	3,500	<8	<2,000	1.90	<0.002
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002
14. Chloroform	5.000	<8	<2,000	<0.4	<0.002
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	0.0043
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002
23. 1,2-Dichloroethane	87,000	<8	<2,000	<0.4	<0.002
34. Methyl ethyl ketone	<10,000	940	<10,000	3.5	<0.01
38. Methylene chloride	<10,000	910	<10,000	<2.0	<0.01
42. Tetrachloroethene	6,000	490	<2,000	<0.4	<0.002
43. Toluene	<2,000	2,300	41,000	3.7	0.0026
45. 1,1,1-Trichloroethane	34,000	130	<2,000	2.3	<0.002
47. Trichloroethene	2,200	360	3,600	<0.4	<0.002
215-217. Xylene (total)	<2,000	3,400	36,000	4.4	<0.002
222. Acetone	<10,000	1,200	<10,000	<2.0	<0.01
226. Ethyl benzene	<2,000	2,200	16,000	4.1	<0.002
229. Methyl isobutyl ketone	<10,000	1,100	<10,000	<2.0	<0.01
SEMIVOLATILES					
51. Acenaphthalene	<10	150	120	<0.002	<0.002
52. Acenaphthene	<10	<20	480	<0.002	<0.002
56. Aniline	<25	<50	<250	1.22	<0.005
57. Anthracene	<10	110	400	<0.002	<0.002
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002
68. Bis(2-chloroethyl)ether	290	<20	<100	<0.002	<0.002
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-9 (Continued)

SAMPLE SET #3 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
SEMIVOLATILES (Continued)					
80. Chrysene	SNA	28	<100	<0.002	<0.002
81. ortho-Cresol	<10	<20	<100	0.020	<0.002
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002
88. p-Dichlorobenzene	80	32	460	0.260	<0.002
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.005
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005
98. Di-n-butyl phthalate	<10	31	120	0.012	0.0046
104. Di-n-octyl phthalate	<10	<20	430	<0.002	<0.002
108. Fluoranthene	<10	120	300	<0.002	<0.002
109. Fluorene	19	53	340	<0.002	<0.002
110. Hexachlorobenzene	73	<100	<500	0.022	<0.01
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.01
113. Hexachloroethane	95	<100	<500	0.018	<0.01
121. Naphthalene	350	<20	400	0.133	<0.002
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.005
136. Pentachlorobenzene	59	<100	1,000	0.020	<0.010
141. Phenanthrene	11	240	950	<0.002	<0.002
142. Phenol	<10	78	1,000	4.56	<0.002
145. Pyrene	<10	200	260	<0.002	<0.002
148. 1,2,4,5-Tetrachlorobenzene	67	<50	1,400	0.008	<0.005
150. 1,2,4-Trichlorobenzene	70	<50	19,000	1.240	<0.005
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.010

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-9 (Continued)

SAMPLE SET #3 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.41
155. Arsenic	<0.2	94	7.4	<0.02	0.030
156. Barium	<0.9	1.3	<19	1.670	0.530
157. Beryllium	<0.1	<0.1	NA	<0.001	<0.001
158. Cadmium	0.53	<0.3	<33	<0.003	0.150
159. Chromium	3.5	40	23.7	<0.009	0.13
160. Copper	1.7	165	107	0.027	1.18
161. Lead	3.4	27	<7.3	0.0064	0.64
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.0015
163. Nickel	2.3	8.8	6.2	0.037	0.057
165. Silver	<0.9	<0.9	<18	0.018	0.0092
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.150
168. Zinc	4.4	4,170	6810	0.071	9.50
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	<5.0	31	15	0.950	14.0
171. Sulfide	NA	830	16,000	17.0	<1.0
PCBs					
206. Arochlor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-9 (Continued)

SAMPLE SET #3 (Continued)

DESIGN AND OPERATING PARAMETERS	DESIGN	OPERATING VALUE↔
Afterburner Temperature (°F)+	*	2400
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)+	*	PCB Blend Feed Rate: 36.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)+		7.2
Carbon Monoxide Concentration (ppm volume)+		0

*This information has been claimed as RCRA Confidential Business Information.

Table 4-10 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #4

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
VOLATILES					
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002
7. Carbon tetrachloride	3,900	<8	<2,000	1.90	<0.002
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002
14. Chloroform	5,300	<8	<2,000	<0.4	<0.002
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	0.014
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002
23. 1,2-Dichloroethane	122,000	<8	<2,000	<0.4	<0.002
34. Methyl ethyl ketone	<10,000	940	<10,000	3.5	<0.01
38. Methylene chloride	<10,000	910	<10,000	<2.0	<0.01
42. Tetrachloroethene	7,200	490	<2,000	<0.4	<0.002
43. Toluene	<2,000	2,300	41,000	3.7	0.0046
45. 1,1,1-Trichloroethane	44,000	130	<2,000	2.3	<0.002
47. Trichloroethene	2,300	360	3,600	<0.4	<0.002
215-217. Xylene (total)	<2,000	3,400	36,000	4.4	<0.002
222. Acetone	<10,000	1,200	<10,000	<2.0	<0.01
226. Ethyl benzene	<2,000	2,200	16,000	4.1	<0.002
229. Methyl isobutyl ketone	<10,000	1,100	<10,000	<2.0	<0.01
SEMIVOLATILES					
51. Acenaphthalene	<10	150	120	<0.002	<0.002
52. Acenaphthene	<10	<20	480	<0.002	<0.002
56. Aniline	<25	<50	<250	1.22	<0.005
57. Anthracene	<10	110	400	<0.002	<0.002
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002
68. Bis(2-chloroethyl)ether	310	<20	<100	<0.002	<0.002
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-10 (Continued)

SAMPLE SET #4 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
SEMIVOLATILES (Continued)					
80. Chrysene	SNA	28	<100	<0.002	<0.002
81. ortho-Cresol	<10	<20	<100	0.020	<0.002
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002
88. p-Dichlorobenzene	84	32	460	0.260	<0.002
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.005
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005
98. Di-n-butyl phthalate	<10	31	120	0.012	0.0042
104. Di-n-octyl phthalate	<10	<20	430	<0.002	<0.002
108. Fluoranthene	<10	120	300	<0.002	<0.002
109. Fluorene	21	53	340	<0.002	<0.002
110. Hexachlorobenzene	61	<100	<500	0.022	<0.010
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.010
113. Hexachloroethane	94	<100	<500	0.018	<0.010
121. Naphthalene	360	<20	400	0.133	<0.002
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.005
136. Pentachlorobenzene	64	<100	1,000	0.020	<0.010
141. Phenanthrene	19	240	950	<0.002	<0.002
142. Phenol	<10	78	1,000	4.56	<0.002
145. Pyrene	<10	200	260	<0.002	<0.002
148. 1,2,4,5-Tetrachlorobenzene	82	<50	1,400	0.008	<0.005
150. 1,2,4-Trichlorobenzene	74	<50	19,000	1.240	<0.005
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.010

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-10 (Continued)

SAMPLE SET #4 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.4
155. Arsenic	<0.2	94	7.4	<0.020	0.029
156. Barium	<0.9	1.3	<19	1.670	0.55
157. Beryllium	<0.1	<0.1	NA	<0.001	<0.001
158. Cadmium	<0.3	<0.3	<33	<0.003	0.13
159. Chromium	1.8	40	23.7	<0.009	0.14
160. Copper	<1.0	165	107	0.027	1.13
161. Lead	2.4	27	<7.3	0.0064	0.600
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.0004
163. Nickel	2.2	8.8	6.2	0.037	0.065
165. Silver	<0.9	<0.9	<18	0.018	0.092
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.150
168. Zinc	9.4	4,170	6810	0.071	9.98
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	5.0	31	15	0.950	13.0
171. Sulfide	NA	830	16,000	17.0	<1.0
PCBs					
206. Aroclor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-10 (Continued)

SAMPLE SET #4 (Continued)

DESIGN AND OPERATING PARAMETERS	DESIGN	OPERATING VALUE++
Afterburner Temperature (°F)*	*	2400
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)*	*	PCB Blend Feed Rate: 36.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)*		6.4
Carbon Monoxide Concentration (ppm volume)*		0

*This information has been claimed as RCRA Confidential Business Information.

Table 4-11 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #5

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
VOLATILES					
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002
7. Carbon tetrachloride	4,000	<8	<2,000	1.90	<0.002
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002
14. Chloroform	6,000	<8	<2,000	<0.4	<0.002
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	<0.002
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002
23. 1,2-Dichloroethane	130,000	<8	<2,000	<0.4	<0.002
34. Methyl ethyl ketone	<10,000	940	<10,000	3.5	<0.01
38. Methylene chloride	<10,000	910	<10,000	<2.0	<0.01
42. Tetrachloroethene	7,800	490	<2,000	<0.4	<0.002
43. Toluene	<2,000	2,300	41,000	3.7	<0.002
45. 1,1,1-Trichloroethane	45,000	130	<2,000	2.3	<0.002
47. Trichloroethene	2,500	360	3,600	<0.4	<0.002
215-217. Xylene (total)	<2,000	3,400	36,000	4.4	<0.002
222. Acetone	<10,000	1,200	<10,000	<2.0	<0.01
226. Ethyl benzene	<2,000	2,200	16,000	4.1	<0.002
229. Methyl isobutyl ketone	<10,000	1,100	<10,000	<2.0	<0.01
SEMIVOLATILES					
51. Acenaphthalene	<10	150	120	<0.002	<0.002
52. Acenaphthene	<10	<20	480	<0.002	<0.002
56. Aniline	<25	<50	<250	1.22	<0.005
57. Anthracene	<10	110	400	<0.002	<0.002
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002
68. Bis(2-chloroethyl)ether	340	<20	<100	<0.002	<0.002
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-11 (Continued)

SAMPLE SET #5 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
SEMIVOLATILES (Continued)					
80. Chrysene	SNA	28	<100	<0.002	<0.002
81. ortho-Cresol	<10	<20	<100	0.020	<0.002
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002
88. p-Dichlorobenzene	90	32	460	0.260	<0.002
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.005
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005
98. Di-n-butyl phthalate	<10	31	120	0.012	0.0027
104. Di-n-octyl phthalate	<10	<20	430	<0.002	<0.002
108. Fluoranthene	<10	120	300	<0.002	<0.002
109. Fluorene	19	53	340	<0.002	<0.002
110. Hexachlorobenzene	87	<100	<500	0.022	<0.01
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.01
113. Hexachloroethane	113	<100	<500	0.018	<0.01
121. Naphthalene	371	<20	400	0.133	<0.002
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.005
136. Pentachlorobenzene	63	<100	1,000	0.020	<0.01
141. Phenanthrene	19	240	950	<0.002	<0.002
142. Phenol	<10	78	1,000	4.56	<0.002
145. Pyrene	<10	200	260	<0.002	<0.002
148. 1,2,4,5-Tetrachlorobenzene	73	<50	1,400	0.008	<0.005
150. 1,2,4-Trichlorobenzene	72	<50	19,000	1.240	<0.005
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.010

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-11 (Continued)

SAMPLE SET #5 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.35
155. Arsenic	<0.2	94	7.4	<0.020	0.027
156. Barium	<0.9	1.3	<19	1.670	0.600
157. Beryllium	<0.1	<0.1	NA	<0.001	0.002
158. Cadmium	0.36	<0.3	<33	<0.003	0.12
159. Chromium	3.2	40	23.7	<0.009	0.14
160. Copper	2.1	165	107	0.027	1.03
161. Lead	2.5	27	<7.3	0.0064	0.48
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.001
163. Nickel	4.8	8.8	6.2	0.037	0.067
165. Silver	<0.9	<0.9	<18	0.018	0.090
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.160
168. Zinc	4.7	4,170	6810	0.071	11.1
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	<5.0	31	15	0.950	12.0
171. Sulfide	NA	830	16,000	17.0	<1.0
PCBs					
206. Aroclor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-11 (Continued)

SAMPLE SET #5 (Continued)

DESIGN AND OPERATING PARAMETERS	DESIGN	OPERATING VALUE↔
Afterburner Temperature (°F)*	*	2400
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)*	*	PCB Blend Feed Rate: 37.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)*		6.8
Carbon Monoxide Concentration (ppm volume)		NR

NR Not Recorded.

*This information has been claimed as RCRA Confidential Business Information.

Table 4-12 TREATMENT PERFORMANCE DATA COLLECTED BY EPA FOR K019
PLANT A - COMBUSTION GAS SCRUBBER TREATMENT SYSTEM

SAMPLE SET #6

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
VOLATILES					
4. Benzene	<2,000	2,000	<2,000	17.0	<0.002
7. Carbon tetrachloride	4,100	<8	<2,000	1.90	<0.002
9. Chlorobenzene	<2,000	<8	<2,000	<0.4	<0.002
14. Chloroform	5,600	<8	<2,000	<0.4	<0.002
21. Dichlorodifluoromethane	<2,000	<8	<2,000	<0.4	<0.002
22. 1,1-Dichloroethane	<2,000	<8	<2,000	<0.4	<0.002
23. 1,2-Dichloroethane	98,000	<8	<2,000	<0.4	<0.002
34. Methyl ethyl ketone	<10,000	940	<10,000	3.5	<0.01
38. Methylene chloride	<10,000	910	<10,000	<2.0	<0.01
42. Tetrachloroethene	6,900	490	<2,000	<0.4	<0.002
43. Toluene	<2,000	2,300	41,000	3.7	<0.002
45. 1,1,1-Trichloroethane	44,000	130	<2,000	2.3	<0.002
47. Trichloroethene	2,500	360	3,600	<0.4	<0.002
215-217. Xylene (total)	<2,000	3,400	36,000	4.4	<0.002
222. Acetone	<10,000	1,200	<10,000	<2.0	<0.01
226. Ethyl benzene	<2,000	2,200	16,000	4.1	<0.002
229. Methyl isobutyl ketone	<10,000	1,100	<10,000	<2.0	<0.01
SEMIVOLATILES					
51. Acenaphthalene	<10	150	120	<0.002	<0.002
52. Acenaphthene	<10	<20	480	<0.002	<0.002
56. Aniline	<25	<50	<250	1.22	<0.005
57. Anthracene	<10	110	400	<0.002	<0.002
65. Benzo(k)fluoranthene	<10	67	<100	<0.002	<0.002
68. Bis(2-chloroethyl)ether	330	<20	<100	<0.002	<0.002
70. Bis(2-ethylhexyl)phthalate	<10	40	<100	0.079	<0.002

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-12 (Continued)

SAMPLE SET #6 (Continued)

Detected BDAT List Organic Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
SEMIVOLATILES (Continued)					
80. Chrysene	SNA	28	<100	<0.002	<0.002
81. ortho-Cresol	<10	<20	<100	0.020	<0.002
87. o-Dichlorobenzene	<10	250	1,060	2.55	<0.002
88. p-Dichlorobenzene	90	32	460	0.260	<0.002
90. 2,4-Dichlorophenol	<25	<50	<250	0.420	<0.005
91. 2,6-Dichlorophenol	<25	<50	500	0.430	<0.005
98. Di-n-butyl phthalate	<10	31	120	0.012	0.0025
104. Di-n-octyl phthalate	<10	<20	430	<0.002	<0.002
108. Fluoranthene	<10	120	300	<0.002	<0.002
109. Fluorene	22	53	340	<0.002	<0.002
110. Hexachlorobenzene	66	<100	<500	0.022	<0.01
111. Hexachlorobutadiene	<50	210	<500	0.079	<0.01
113. Hexachloroethane	88	<100	<500	0.018	<0.01
121. Naphthalene	390	<20	400	0.133	<0.002
122. 1,4-Naphthoquinone	<10	<20	<100	0.078	<0.002
126. Nitrobenzene	<25	3,400	8,200	0.027	<0.005
136. Pentachlorobenzene	65	<100	1,000	0.020	<0.01
141. Phenanthrene	17	240	950	<0.002	<0.002
142. Phenol	<10	78	1,000	4.56	<0.002
145. Pyrene	<10	200	260	<0.002	<0.002
148. 1,2,4,5-Tetrachlorobenzene	86	<50	1,400	0.008	<0.005
150. 1,2,4-Trichlorobenzene	79	<50	19,000	1.24	<0.005
152. 2,4,6-Trichlorophenol	<50	<100	<500	0.037	<0.01

SNA A standard is not available; the compound was searched using an NBS Library data-base of 42,000 compounds. The compound was not detected.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-12 (Continued)

SAMPLE SET #6 (Continued)

Detected BDAT List Metal, Inorganic and PCB Constituents	Untreated Waste Concentration				Treated Waste
	K019 mg/kg (ppm)	RCRA Blend* mg/kg (ppm)	PCB Blend* mg/kg (ppm)	Mercaptan-Contaminated Waste* mg/L (ppm)	Scrubber Water mg/L (ppm)
METALS					
154. Antimony	<6.0	24	<41	<0.060	0.32
155. Arsenic	<0.2	94	7.4	<0.020	0.033
156. Barium	<0.9	1.3	<19	1.670	0.57
157. Beryllium	<0.1	<0.1	NA	<0.001	<0.001
158. Cadmium	0.62	<0.3	<33	<0.003	0.11
159. Chromium	5.3	40	23.7	<0.009	0.13
160. Copper	3.6	165	107	0.027	0.87
161. Lead	3.5	27	<7.3	0.0064	0.4
162. Mercury	<0.05	<0.05	<5.5	<0.001	0.001
163. Nickel	6.0	8.8	6.2	0.037	0.061
165. Silver	<0.9	<0.9	<18	0.018	0.092
167. Vanadium	<2.0	2.2	<2.6	<0.020	0.16
168. Zinc	8.4	4,170	6810	0.071	10.4
INORGANICS					
169. Total Cyanide	<0.5	0.9	<0.5	<0.010	<0.01
170. Fluoride	<5.0	31	15	0.950	12.0
171. Sulfide	NA	830	16,000	17.0	<1.0
PCBs					
206. Aroclor 1260	NA	NA	33,500	NA	NA

NA Not Analyzed.

* Only one sample of this waste type was taken. The results are repeated in each sample set.

Table 4-12 (Continued)

SAMPLE SET #6 (Continued)

DESIGN AND OPERATING PARAMETERS	DESIGN	OPERATING VALUE++
Afterburner Temperature (^{o}F)+	*	2350
Residence Time (sec)	*	2
Waste Feed Rate (MMBTU/hr)+	*	PCB Blend Feed Rate: 37.5 Mercaptan-Contaminated Waste Feed Rate: 0.18
Excess Oxygen Concentration (%)+		7.0
Carbon Monoxide Concentration (ppm volume)		NR

NR Not Recorded.

*This information has been claimed as RCRA Confidential Business Information. The information is available in the confidential portion of the Administrative Record for this rulemaking.

5. IDENTIFICATION OF BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT)

This section presents the Agency's rationale for determining best demonstrated available technology (BDAT) for K073 nonwastewaters and wastewaters.

To determine BDAT, the Agency examines all available performance data on technologies that are identified as demonstrated to determine (using statistical techniques) whether one or more of the technologies performs significantly better than the others. All performance data used for determination of best technology must first be adjusted for accuracy, as discussed in EPA's publication Methodology for Developing BDAT Treatment Standards. (An accuracy adjustment accounts for the ability of an analytical technique to recover a particular constituent from the waste in a particular test. The recovery of a constituent is usually determined by spiking a sample with a known amount of the target constituent and then comparing the spiked sample amounts with results from unspiked samples.) BDAT must be specifically defined for all streams associated with the management of the listed waste or wastes; this pertains to the original waste as well as any residual waste streams created by the treatment process. Additionally, the ANOVA test is available to compare two or more demonstrated technologies and determine which offers the best treatment. The ANOVA test is described fully in the Methodology background document (USEPA 1989a).

The technology that performs best, based on ANOVA tests, on a particular waste or waste treatability group is then evaluated to determine whether it is "available." To be available, the technology must (1) be commercially available to any generator and (2) provide "substantial" treatment of the waste, as determined through evaluation of

accuracy-adjusted data. In determining whether treatment is substantial, EPA may consider data on the performance of a waste similar to the waste in question provided that the similar waste is at least as difficult to treat. If the best technology is found to be not available, then the next best technology is evaluated, and so on.

Incineration is the only technology identified as demonstrated for K019 and, consequently, K073 waste (see Section 4). EPA has determined in Section 3 that incineration is commercially available and demonstrated on a waste similar to K073. Also, EPA believes that incineration provides substantial treatment because no constituents in K019 have higher boiling points than those of the constituents of concern in K073. These K019 constituents have been reduced to nondetectable levels; therefore, the constituents proposed for regulation in K073 can be reduced to nondetectable levels in the residual nonwastewater ash and in the residual wastewater stream (the scrubber water). Thus, incineration is "best."

As "best," "demonstrated," and "available," incineration is therefore BDAT for K073 waste.

6. SELECTION OF REGULATED CONSTITUENTS

This section presents the methodology and rationale for the selection of regulated constituents for the treatment of K073.

Generally, constituents selected for regulation must satisfy the following criteria:

1. They must be on the BDAT list of regulated constituents. (Presence on the BDAT list implies the existence of approved techniques for analyzing the constituent in treated waste matrices.)

2. They must be present in, or be suspected of being present in, the untreated waste. For example, in some cases, analytical difficulties (such as masking) may prevent a constituent from being identified in the untreated waste, but its identification in a treatment residual may lead the Agency to conclude that it is present in the untreated waste.

3. Where performance data are transferred, the selected constituents must be easier to treat than the waste constituent(s) from which performance data are transferred. Factors for assessing ease of treatment vary according to the technology of concern. For instance, for incineration the factors include bond dissociation energy, thermal conductivity, and boiling point.

From the group of constituents that are eligible to be regulated (i.e., all constituents on the BDAT list), EPA may select a subset of constituents as representative of the broader group. For example, out of a group of constituents that react similarly to treatment, the Agency might name only those that are the most difficult to treat as regulated constituents for the purpose of setting a standard.

6.1 Identification of BDAT List Constituents

As discussed in Sections 2 and 4, the Agency has no performance data from treatment of K073 by incineration. Compositional data were obtained

from the Listing Background Document for this waste and The Chlorine Institute, Inc.. Performance data are available for K019, which the Agency believes is similar to K073 because they both contain carbon tetrachloride, chloroform, hexachloroethane, tetrachloroethene, and 1,1,1-trichloroethane, and therefore represents a source of transfer. These data, along with information on the K073 waste-generating process, have been used to determine which BDAT list constituents are or may be present in the waste and thus which ones are potential candidates for regulation. Table 6-1 (at the end of this section) indicates, for the untreated waste, which constituents the Agency believes may be present. These 11 constituents were considered as candidates for regulation.

6.2 Constituent Selection

The Agency is proposing to regulate 5 of the 11 candidates believed to be present in K073. The constituents are carbon tetrachloride, chloroform, hexachloroethane, tetrachloroethene, and 1,1,1-trichloroethane. These constituents are those that are believed to be present in the highest concentrations.

Although other constituents appear in the compositional data for K073, they are present at much lower concentrations than the five constituents proposed for regulation. The Agency, therefore, believes that incineration will destroy these other constituents as well as those proposed for regulation.

Table 6-1 Potential Candidates for Regulation

Constituent
Volatile organics
Carbon tetrachloride[a]
Chloroform[a]
Hexachloroethane[a]
Tetrachloroethene[a]
1,1,1-Trichloroethane[a]
Pentachloroethane
Tetrachloroethylene
Dichloroethylene
1,1,2,2-Tetrachloroethane
Various chlorinated propanes

[a]These constituents are selected for regulation.

7. DEVELOPMENT OF BDAT TREATMENT STANDARDS

The Agency bases numerical treatment standards for regulated constituents on the performance of well-designed and well-operated BDAT treatment systems. These standards must account for analytical limitations in available performance data and must be adjusted for variabilities related to treatment, sampling, and analytical techniques and procedures.

Concentration-based BDAT standards are determined for each constituent by multiplying the arithmetic mean of accuracy-adjusted constituent concentrations detected in the treated waste by a "variability factor" specific to each constituent. Accuracy adjustment of performance data was discussed in Section 5 in relation to defining "substantial treatment." Variability factors correct for normal variations in the performance of a particular technology over time. They are designed to reflect the 99th percentile level of performance that the technology achieves in commercial operation.

Where EPA has identified BDAT for a particular waste, but because of data limitations or for some other compelling reason cannot define specific treatment standards for that waste, the Agency can require the use of that treatment process as a technology standard. Similarly, where there are no known generators of a waste, or where EPA believes that the waste can be totally recycled or reused as a raw material, the Agency may specify a "no land disposal" standard, which effectively amounts to setting the performance standard at zero for all waste constituents.

In the case of K073 waste, the Agency is setting treatment standards for the organic constituents shown in Tables 7-1 and 7-2 at the end of this section. These treatment standards are based on the performance data from incineration of K019 waste (see Tables 4-1 through 4-12).

The accuracy-adjusted concentration for Tables 7-1 and 7-2 constituents is the analytical result multiplied by a correction factor.

After treatment performance data are corrected for accuracy, the arithmetic average of the corrected data is calculated for each constituent. In cases where the constituent is not detected above its detection limit, the detection limit is used to calculate the average constituent concentration in the treated waste. The next step in calculating treatment standards is to determine the variability factor for each regulated constituent.

EPA is using a variability factor of 2.8 for all treatment standard calculations for K073 nonwastewaters because treatment performance data for each constituent transferred from K019 was below the detection limit in the K019 incinerator ash. The variability factors for constituents in K073 wastewaters are also all 2.8 because the treatment performance for each constituent transferred from K019 was below the detection limit in the incinerator scrubber water. EPA's publication Methodology for Developing BDAT Treatment Standards details both accuracy adjustment and the determination and use of variability factors.

Table 7-3 summarizes all treatment standards being established for K073 waste. Note that concentrations are expressed in terms of mg/kg and mg/l for nonwastewaters and wastewaters, respectively.

Table 7-1 Calculations of Nonwastewater Treatment Standards for Constituents Proposed for Regulation in K073 Waste

Constituent	Treated average nonwastewater concentration (mg/kg)	Analytical recovery (%)	Correction factor (reciprocal of analytical recovery)	Corrected analytical values	Variability factor	Treatment standard (mg/kg)
Volatile organics						
Carbon tetrachloride	<2.0	91	1.1	2.2	2.8	6.2
Chloroform	<2.0	91	1.1	2.2	2.8	6.2
Tetrachloroethene	<2.0	91	1.1	2.2	2.8	6.2
1,1,1-Trichloroethane	<2.0	91	1.1	2.2	2.8	6.2
Semivolatile organics						
Hexachloroethane	<10.0	103	1.0*	10.0	2.8	28

*For recoveries greater than 100%, the Agency is using a maximum value of 100%. The correction factor (the reciprocal of the analytical recovery) is therefore 1.0.

Table 7-2 Calculations of Wastewater Treatment Standards for Constituents Proposed for Regulation in K073 Waste

Constituent	Treated average wastewater concentration (mg/kg)	Analytical recovery (%)	Correction factor (reciprocal of analytical recovery)	Corrected analytical values	Variability factor	Treatment standard (mg/kg)
Carbon tetrachloride	<0.002	78	1.3	0.003	2.8	0.008
Chloroform	<0.002	78	1.3	0.003	2.8	0.008
Tetrachloroethene	<0.002	78	1.3	0.003	2.8	0.008
1,1,1-Trichloroethane	<0.002	78	1.3	0.003	2.8	0.008
Semivolatile organics						
Hexachloroethane	<0.010	84	1.19	0.012	2.8	0.033

Table 7-3 Treatment Standards for K073 Waste

Constituent	Maximum for any single grab sample Nonwastewaters Total concentration (mg/kg)	Maximum for any single grab sample Wastewaters Total concentration (mg/l)
Volatile organics		
Carbon tetrachloride	6.2	0.008
Chloroform	6.2	0.008
Tetrachloroethene	6.2	0.008
1,1,1,-Trichloroethane	6.2	0.008
Semivolatile organics		
Hexachloroethane	28	0.033

NA = Not applicable.

8. REFERENCES

USEPA. 1980. U.S. Environmental Protection Agency, Office of Solid Waste. RCRA listing background document. Washington, D.C.: U.S. Environmental Protection Agency.

USEPA. 1987. U.S. Environmental Protection Agency, Office of Solid Waste. Generic quality assurance project plan for land disposal restrictions program ("BDAT"). EPA/530-SW-87-011. Washington, D.C.: U.S. Environmental Protection Agency.

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USEPA. 1989b. U.S. Environmental Protection Agency, Office of Solid Waste. Treatment technology background document. Washington, D.C.: U.S. Environmental Protection Agency.